UNIVERSITY OF LONDON

GARDEN HALLS, UNIVERSITY OF LONDON

Arboricultural Survey, Arboricultural Impact Assessment and Arboricultural Method Statement

March 2013

Project No.: AUPP101 / 001 / 004

March 2013

Garden Halls Student Accommodation, Bloomsbury, London

Arboricultural Survey, Arboricultural Impact Assessment and Arboricultural Method Statement

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Contents

1. Summary

1.1.1 This report has been prepared to inform the redevelopment of Garden Halls, Cartwright Gardens by the University of London. This report has been commissioned by the applicant's development manager, University Partnership Programme, to support the planning and Conservation Area consent applications.

1.1.2 The University of London proposes the refurbishment and redevelopment of student accommodation located in Bloomsbury, London (see Figure 1 for site location). Proposals are for the demolition of Canterbury (including York) and Commonwealth Halls, partial demolition of Hughes Parry Hall and the provision of new student accommodation (Sui Generis) to provide a net increase in 187 units and associated ancillary uses (including communal areas), together with realm improvements to Cartwright Gardens and the surrounding area.

1.1.3 University Partnerships Programme Ltd commissioned Thomson Ecology, on behalf of the University of London, to update the Arboricultural Impact Assessment (AIA) and Arboricultural Method Statement (AMS) produced as part of Thomson Ecology report ref: MDAH101/002/001 (November 2011), and to undertake an arboricultural survey of up to 50 trees within Cartwright Gardens open space. This document details the survey methodology and results of the arboricultural survey and the updated AIA and AMS. The arboricultural survey within the extended survey boundary was carried out in accordance with BS5837:2012 '*Trees in Relation to Design, Demolition and Construction – Recommendations'* (BSI, 2012).

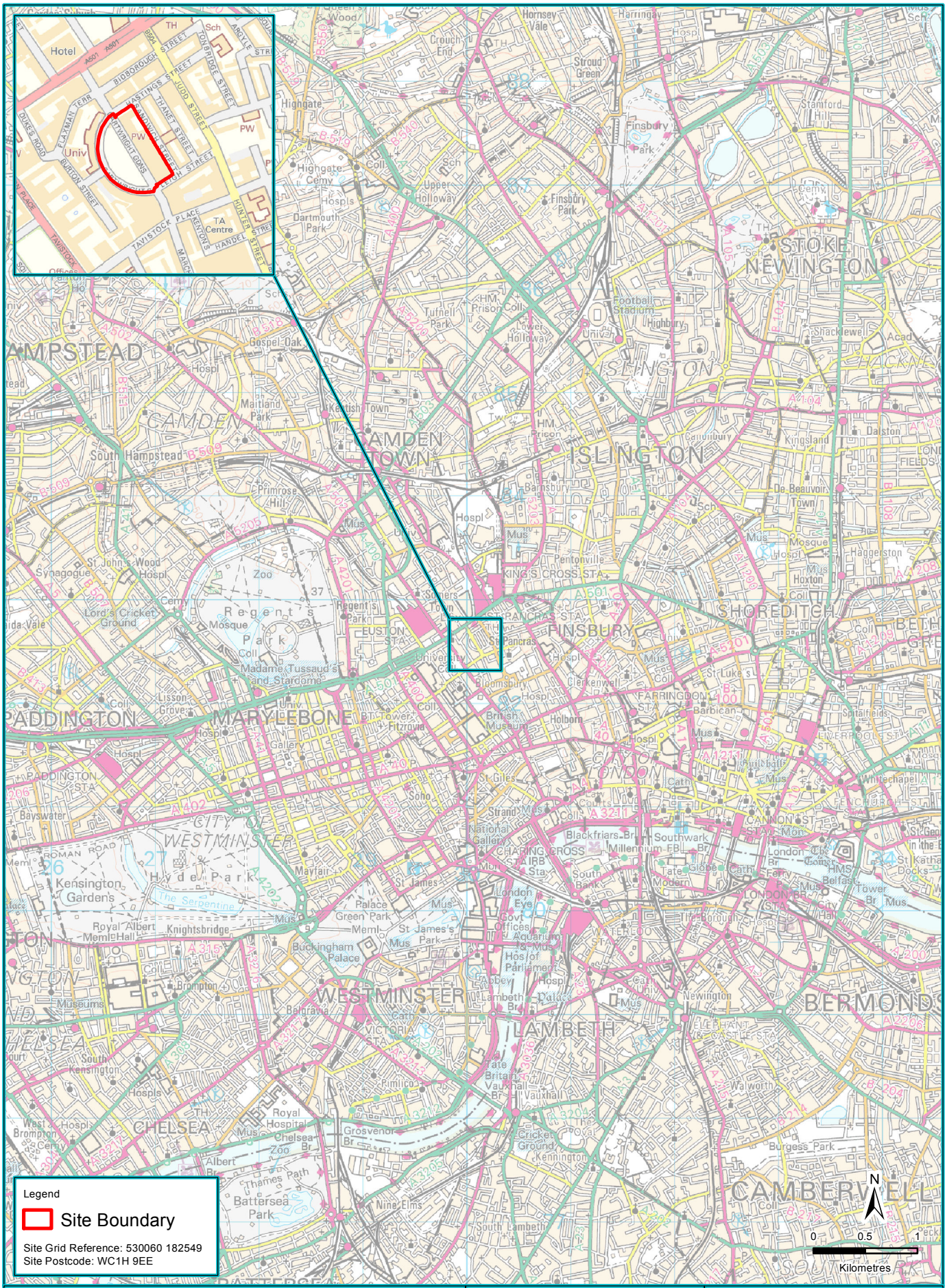
1.1.4 All trees were categorised in accordance with the cascade chart in BS5837:2012. Trees were given a ranking of A, B or C in descending order of value and assigned one or more subcategories qualifying the basis of that value as either arboricultural, landscape or cultural. Trees with only short-term remaining value or that require immediate removal for safety or management reasons are given a U rating.

1.1.5 A total of 42 individual trees were recorded during the combined surveys and listed in the Tree Schedule (see Appendix 1). The combined surveys recorded 10 Category A trees, 18 Category B trees, 13 Category C trees and one Category U tree located within or adjacent to the site and extended survey area.

1.1.6 Category A, B and C trees represent a material consideration to development. Strong effort should be made to retain A and B category trees within the development. Whilst Category C trees should be retained where possible, they should not be retained where they would present a serious constraint to development.

1.1.7 The results of the AIA show that the proposed development will result in the removal of seven trees from the site. However, six of these are either Category C or U and their loss will therefore not have a significant detrimental effect on the arboricultural value of the site.

1.1.8 The AMS details how tree protection fencing, ground protection and special construction techniques will be utilised to protect the retained trees on site during the construction phase.



Client: University of London		Drawing Ref: AUPP101/11109/1	
Figure Number: 1		Scale at A4: 1:50,000	
Figure Title: Site Location		Drawn: NS	Checked: TD
		Date: 01/10/2012	Date: 01/10/2012

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Filepath: S:\Guildford\Projects\AUPP101 Updated AIA and AMS Cartwright Gardens\Reporting\Mapping\Working\AUPP101_Fig1_SiteLocation_NS_011012.mxd
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Legend

- Root Protection Area of Category 'A' Tree
- Root Protection Area of Category 'B' Tree
- Root Protection Area of Category 'C' Tree
- Root Protection Area of Category 'U' Tree
- Tree Stem Location
- Tree Canopy Extent
- Site Boundary

Site Grid Reference: 530060 182549
Site Postcode: WC1H 9EE

Base mapping supplied by the client University Partnerships Programme

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Drawing Ref	AUPP101/11110/1
Scale at A3	1:800
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Date: 01/10/2012	Date: 01/10/2012
Client	University of London
Figure Number	2
Figure Title	Tree Constraints Plan (TCP01)

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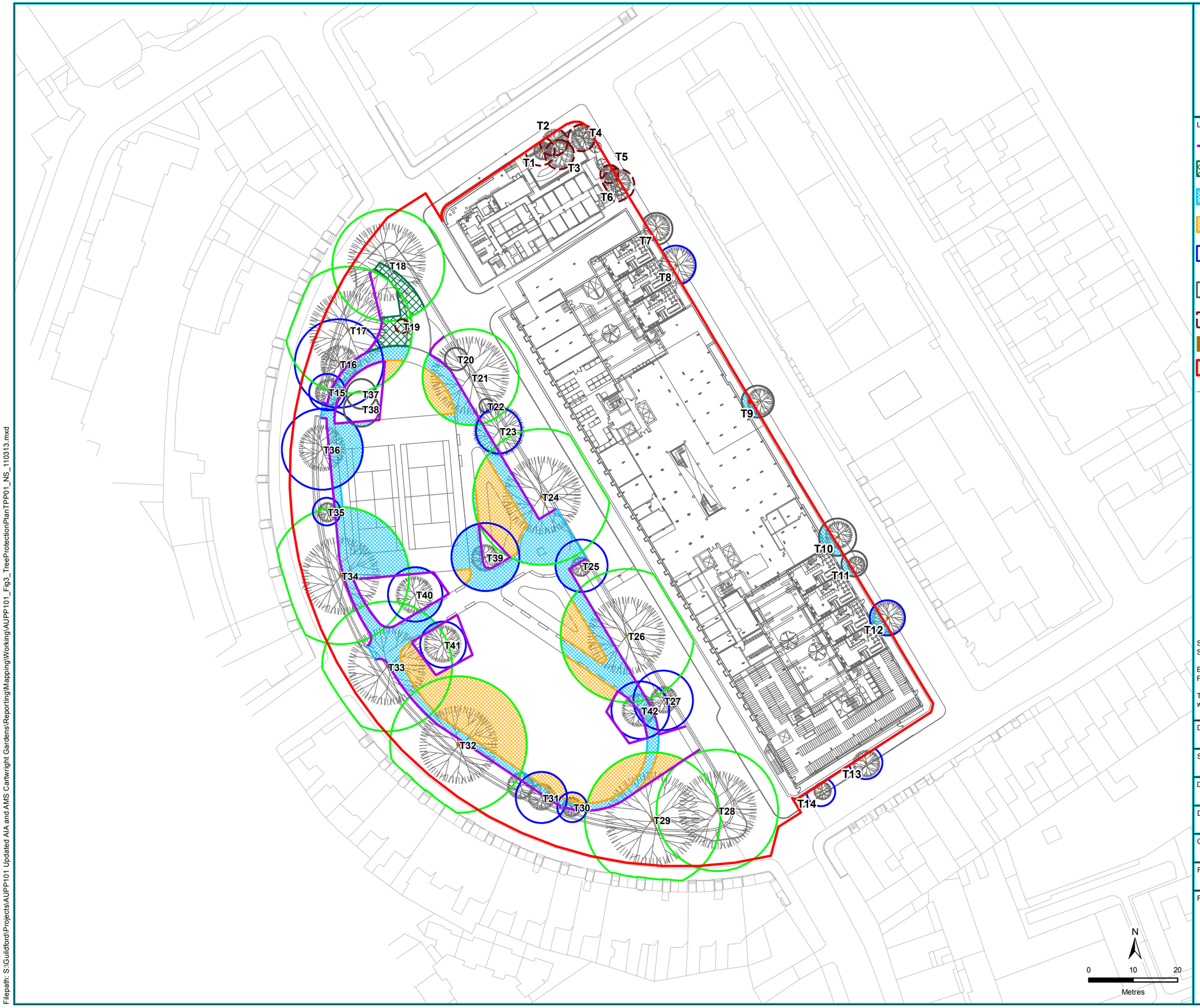

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Legend

- Tree Protection Fencing
- 'No Dig' Construction Methods
- Ground Protection Afforded by Existing Hardstanding
- Ground Protection
- Root Protection Area of Category 'B' Tree
- Root Protection Area of Category 'C' Tree
- Tree to be Removed
- Tree Stem Location
- Site Boundary
- Proposed Development

Site Grid Reference: 530060 182549
Site Postcode: WC1H 9EE

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Drawing Ref	AUPP101/11140/1
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Drawn: NS	Checked: TD
Date: 02/10/2012	Date: 02/10/2012
Client	University of London
Figure Number	3
Figure Title	Tree Protection Plan (TPP01)

Filepath: S:\Guildford\Projects\AUPP101 Updated AIA and AMS Cartwright Gardens\Reporting\Mapping\Working\AUPP101_Fig3_TreeProtectionPlanTPP01_NS_110313.mxd

2. Introduction

2.1 Development Background

2.1.1 The University of London is proposing the refurbishment and redevelopment of some of the University of London's student accommodation located in Bloomsbury, London. Proposals include the demolition of Canterbury (including York) and Commonwealth Halls, partial demolition of Hughes Parry Hall and the provision of new student accommodation (Sui Generis) to provide a net increase in 187 units and associated ancillary uses (including communal areas), together with realm improvements to Cartwright Gardens and the surrounding. Access will be available from Sandwich Street, Leigh Street and Cartwright Gardens. The proposals described above are hereafter referred to collectively as 'the development'.

2.1.2 The development is located on a 1.45ha area of land (grid reference TQ30082 82564), shown on Figure 1. The area affected by the development is hereafter referred to as 'the site'.

2.1.3 There are a number of trees within the site, and adjacent to the site boundary, that may be affected by development. The trees within and immediately adjacent to the existing halls were surveyed as part of Thomson Ecology report ref: MDAH101/002/001 (November 2011).

2.1.4 Adjacent to the existing halls, Cartwright Gardens open space is located, which contains a number of formally planted trees. This area has been incorporated into the proposals and now forms part of the site.

2.1.5 The purpose of this document is to accompany the planning application submission to the London Borough of Camden.

2.2 Site Description

2.2.1 The site compromises three University of London halls of residence: Canterbury (including York) Hall, Hughes Parry Hall and Commonwealth Hall. Each hall of residence is a multi-storey building with associated areas of car parking space and other hardstanding. A small area of formally planted trees and shrubs is located in the north east corner of the site, whilst street trees are present immediately adjacent to the site boundary on Sandwich Street and Leigh Street. To the west of the existing halls Cartwright Gardens open space is located, compromising private, gated landscaped gardens, four tennis courts, with a number of mature trees lining the boundaries.

2.3 Brief and Objectives

2.3.1 University Partnerships Programme Ltd commissioned Thomson Ecology, on behalf of the University of London, on 25th September 2012 to update the existing Arboricultural Impact Assessment (AIA) and Arboricultural Method Statement (AMS) based on the new proposed site layout, and also to extend the arboricultural survey to Cartwright Gardens themselves, adjacent to the site.

2.3.2 The objective of the survey and associated report was to assess the condition of the existing trees on site and any off site trees that might be affected by the development, providing sufficient information to enable decisions to be made on potential design layout and tree retention for the proposed development. The brief was to:

- Produce an update of the AIA and AMS for the site based on the tree survey data from Thomson Ecology report ref: MDAH101/002/001 (November 2011) and the new proposed layout;
- Produce an updated Tree Protection Plan;
- Undertake an arboricultural survey of up to 50 trees (grouped where deemed appropriate) adjacent to the halls and within Cartwright Gardens themselves, in line with BS5837:2012; and
- The incorporation of these results into the updated reporting and mapping.

2.4 Limitations

2.4.1 The information provided within this report and in the accompanying Tree Schedule covers only those trees that were inspected and their condition at the time of survey. The original tree survey (Thomson Ecology report ref: MDAH101/002/001) was undertaken to BS5837:2005, whilst the September 2012 survey was undertaken to BS5837:2012. To avoid confusion, trees recorded as Category R in the original survey are referred to as the BS5837:2012 equivalent, Category U, within this report. There are no significant differences between the definitions of these two categorisations.

2.4.2 Whilst this report makes general observations on the long term potential of the trees surveyed, trees are dynamic organisms and subject to continual change, thus this report should not be relied upon for the purposes of development for more than 12 months from the date of survey.

2.4.3 A full hazard assessment has not been made and therefore no guarantee is given as to the structural integrity of any of the trees onsite.

2.4.4 Where trees were clad in ivy (*Hedera helix*), dense epicormic growth or dense underplanting obscured the main stem this was recorded in the Tree Schedule. The inspection of such trees is impeded and as such a further inspection may be required following the removal of the obstruction. The Retention Categories of such trees should be considered as provisional only.

3. Methodology

3.1 Desk Study

3.1.1 Records of Tree Preservation Orders (TPOs) existing at the site and Conservation Areas within or adjacent to the site were sought from the London Borough of Camden.

3.2 Tree Survey

3.2.1 All significant trees within the extended survey area were assessed for their potential to be affected by the development proposals. Significant trees are defined as those with a trunk diameter of greater than 75mm at 1.5m above ground level according to the survey methodology outlined in BS 5837:2005. Off-site or third party trees have been included where it is likely they would influence the development.

3.2.2 The trees surveyed were inspected from ground level only, were not climbed and no internal investigations were undertaken.

3.2.3 Trees were categorised as single trees or those that formed part of a distinct group such as a woodland or hedgerow. Groups can be defined as cohesive arboricultural features, either aerodynamically, visually or culturally (BS5837:2012).

3.2.4 The trees were assessed using a qualitative assessment, categorising the quality and value of the trees based on arboricultural, landscape and cultural (including conservation) features. Each tree was then placed into one of four categories based on quality and value. Definitions for these categories can be found in Appendix 2. The information recorded for each tree can be seen in Table 1.

Table 1: Information recorded for each tree during survey

Attribute	Description
Tree No.	Numerical reference given in sequential order starting at number '1', corresponding with the numbers as set out in Figure 2; trees are given the prefix 'T', groups 'G', woodlands 'W' and hedgerows 'H'.
Species	The common names are based upon on site identification and expressed according to "*Tree Guide*" (Johnson & More, 2004).
Height	Measured approximately from ground level with the aid of a clinometer and shown in metres (m).

Attribute	Description
Stem Diameter	Diameter measured at approximately 1.5m above ground level. In the case of multi-stemmed trees, measurement is taken of each stem at 1.5m, where there are two to five stems; or a mean stem diameter at 1.5m, where there are more than five stems. Given in millimetres (mm).
Canopy Spread	Maximum branch spread measured in metres from the centre of the trunk in the direction of the four cardinal points of the compass (or an average can be given if branches demonstrate an even spread).
Crown Clearance	Height above ground level of the first significant branch and direction of growth, and the height above ground level of the overall canopy.
Age Class	• Young – less than one-third natural life span spent; • Middle-aged – between one-third and two-thirds natural life span spent; • Mature – greater than two-thirds life span completed; • Over-mature – mature, and in an overall state of decline; • Veteran – surviving beyond the typical age range for the species with a high value in terms of conservation and amenity.
Physiological Condition	Overall health, condition and function of the tree in comparison to a 'normal' example of the species of a similar age; e.g. 'good', 'fair', 'poor' or 'dead'. If deemed necessary, these gradings may be elaborated upon in the 'Comments' section.
Structural Condition	The overall structural condition of the tree including the roots, butt, trunk, limbs and their unions, and the presence of any structural defects, decay or pathological defects. • Good - no significant visible structural defects with a form typical for the species; • Fair - a specimen with only minor defects that are easily remedied or of no long term significance; • Poor - significant and irremediable physiological or structural defects that may lead to early or premature decline; • Hazardous - significant structural defects of such a degree that there is a risk of imminent collapse or failure. If deemed necessary, these gradings may be elaborated upon in the 'Comments' section.

Attribute	Description
Comments	Comments have been made, where appropriate, relating to location, health and condition, structure and form, estimated life expectancy, conservation value and amenity value within the local landscape.
Preliminary Management Recommendations	Tree work that should be undertaken for good arboricultural management, regardless of the requirements of the development.
Estimated Remaining Contribution	The estimated time, in years, that the tree will provide a safe contribution to the site (i.e. <10, 10-20, 20-40 and >40).

Quality Assessment

3.2.5 On the basis of this assessment each tree was then placed into one of the four categories based on quality and value. The four categories can be seen in Table 2.

Table 2: Quality assessment categories

Category	Description
Category U	Trees in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years.
Category A	Trees of high quality with an estimated life expectancy of at least 40 years.
Category B	Trees of moderate quality with an estimated remaining life expectancy of at least 20 years.
Category C	Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm.

3.2.6 Trees categorised as either A, B or C, were also allocated up to three subcategories. The subcategories chosen for each tree are dependent on the main reasons for selection of the particular category grading. The three subcategories are as follows:

- 1 – Category grading based on mainly arboricultural qualities;
- 2 – Category grading based on mainly landscape qualities; and
- 3 – Category grading based on mainly cultural values, including conservation.

Root Protection Areas (RPAs)

3.2.7 Trees that are selected for retention on the site could be at risk of damage during construction, such as root damage during the excavations for foundations or services or any ground-working for landscaping. Further impacts on the trees may potentially result from vehicle movements and materials storage, including root severance, compaction of the soil and exclusion of air and water to the soil. The risk of tree damage is minimised if construction activities are planned to avoid the roots of trees.

3.2.8 The area of ground adjacent to each tree or group of trees that contains the majority of the roots can be calculated using the equation provided in the BS5837:2012. This Root Protection Area (RPA) is a radius around the tree of 12 times the stem diameter for a single stem. For multi-stemmed trees of two to five stems and greater than five stems, the cumulative stem diameters to be multiplied by 12, are calculated as per the equations in Table 3.

Table 3: Equations for the calculation of the RPA of multi-stemmed trees

Number of stems	Equation
Two to five	√(stem diameter 1)² + (stem diameter 2)² … + (stem diameter 5)²
More than five	√(mean stem diameter)² x number of stems

3.2.9 The RPA for each tree in the Tree Schedule has been calculated and, where relevant, has been adjusted to take into account site conditions. For example, when a tree is growing in a confined root space adjacent to an existing building or other solid structure that would restrict root growth in that direction, the RPA has been adjusted accordingly (see Figure 2).

3.2.10 The RPA for tree groups is calculated using the stem or basal diameter of the largest tree within the group. The RPA radius is calculated as per Section 3.2.8 and then used to define the RPA by following the outline of the group's extent.

3.2.11 Where the calculated RPA exceeds 707m^2, it has been capped at this figure, as per BS5837:2012. This is equivalent to a circle with a radius of 15m or a square with approximately 26m sides.

Date of Survey

3.2.12 The site visit and survey associated with Thomson Ecology report ref: MDAH101/002/001 was undertaken on 9th November 2011 by Sam Lowe BSc (Hons) MSc TechCert(ArborA) MArborA.

3.2.13 The survey of the remainder of the site (Cartwright Gardens open space) was undertaken on 27th September 2012, also by Sam Lowe.

Weather Conditions

3.2.14 The weather conditions at the time of the original survey were overcast, with deciduous trees in partial leaf. Whilst the weather conditions at the time of the survey of the extended survey area were overcast with sunny patches and deciduous trees were in full leaf.

4. Results

4.1 Desk Study

4.1.1 It was confirmed by Robert Augustine of the London Borough of Camden via telephone on 2nd October 2012, that no trees within the site or immediately adjacent to the site are covered by Tree Preservation Orders. However, the site is located within a Conservation Area.

4.1.2 Under the Town and Country Planning (Tree Preservation) (England) Regulations 2012 it is prohibited to cut down, top, lop, uproot, wilfully damage or wilfully destroy; or cause or permit the cutting down, topping, lopping, uprooting, wilful damage or wilful destruction of any tree, or group of trees, subject to a TPO or that is located within a Conservation Area except with the consent of the local authority.

4.2 Tree Survey

4.2.1 A total of 42 significant individual trees located within or immediately adjacent to the site boundary were recorded during the survey. A breakdown of categories can be found in Table 4. The locations of all trees, RPAs, retention categories and reference numbers are shown on Figure 2. A detailed description of each tree is given in the Tree Schedule in Appendix 1.

Table 4: Number of significant trees allocated to each retention category.

	Category A Trees	Category B Trees	Category C Trees	Category U Trees
Number of Trees in Category	10	18	13	1
Tree Numbers	T17, T18, T21, T24, T26, T28, T29, T32, T33, T34	T6, T8, T12, T13, T14, T15, T16, T23, T25, T27, T30, T31, T35, T36, T39, T40, T41, T42	T1, T2, T3, T4, T7, T9, T10, T11, T19, T20, T22, T37, T38	T5

4.2.2 The subcategories assigned to each tree surveyed can be seen in the Tree Schedule in Appendix 1. A list of the criteria used to determine the category and subcategories of the trees can be found in Appendix 2 - Table of Quality Assessment.

Root Protection Areas (RPAs)

4.2.3 The RPAs for the trees surveyed can be seen in Figure 2. The actual RPAs, in m^2, for the individual trees surveyed are shown in Appendix 1.

5. Arboricultural Impact Assessment (AIA)

5.1.1 The purpose of the AIA is to assess the likely impact of the proposed development on the existing trees on site and to determine which trees are to be removed or retained during the construction phase.

5.1.2 The protection of retained trees is paramount to their survival during the development process and their consequent long term contribution to the site. The Root Protection Areas (RPAs) identified in the Arboricultural Survey and Tree Constraints Plan (TCP) should remain protected throughout the development to avoid potential damage, such as:

- Soil compaction;
- Root severance due to excavation;
- Soil coverage with impermeable material;
- Alterations in ground level;
- Leaks and spillages from stored materials; and
- Vehicle and heavy plant collision.

5.2 Documents

5.2.1 This assessment has been based on documents produced by TP Bennett LLP and Macfarlane Wilder. The details of these documents can be seen in Table 5.

Table 5: Documents upon which this assessment has been based

Originator	Reference No.	Title
TP Bennett Architecture	C08 - 099 - P1	Proposed Plans - Lower Ground Floor Plan
TP Bennett Architecture	C08 - 100 - P1	Proposed Plans - Ground Floor Plan
Macfarlane Wilder	1488.P101	Landscape Masterplan

5.3 Tree Removals

5.3.1 A total of seven trees require removal in order to facilitate this development. A breakdown of the associated categories assigned to these specimens can be seen in Table 6 and the species of tree to be removed in Table 7.

Table 6: Number of trees to be removed within each retention category

	Category A Trees	Category B Trees	Category C Trees	Category U Trees
Number of Trees	**0**	**1**	**5**	**1**

Table 7: Details of trees to be removed

Tree Number	Species	Category	Reason
T1	*Acer saccharinum*; silver maple	C1,2	To facilitate the development
T2	*Cotoneaster frigidus*; Himalayan tree cotoneaster	C1,2	To facilitate the development
T3	*Cotoneaster frigidus*; Himalayan tree cotoneaster	C1,2	To facilitate the development
T4	*Fraxinus excelsior*; ash	C1,2	To facilitate the development
T5	*Betula utilis*; Himalayan birch	U	Good arboricultural practice
T6	*Betula utilis*; Himalayan birch	B1,2	To facilitate the development
T19	*Crataegus crus-galli;* cockspur thorn	C1	To facilitate the development

5.3.2 Although the proposed development will result in the removal of seven trees, six of these are either Category C or U, the loss of which will not have a significant detrimental effect on the arboricultural value of the site.

5.3.3 As these trees are located within a Conservation Area, full planning permission should be obtained before their removal, unless written consent is received prior to this from the London Borough of Camden.

5.4 Trees to be Retained

5.4.1 Of the trees surveyed, 35 within or immediately adjacent to the site are to be retained and protected throughout development.

5.4.2 The RPAs of the retained trees within Cartwright Gardens open space should be protected by fencing to the specification laid out in BS5837:2012 '*Trees in Relation to Design, Demolition and*

Construction – Recommendations' during the implementation landscaping works within this area of the site. The specification of this fencing is detailed in Section 6.6.1 of the AMS. The area protected by the fencing shall be known as the Construction Exclusion Zone (CEZ).

Shading

5.4.3 As there is no change in use for the development and little change in its footprint, there should be no major increase in the amount of shade cast by the retained trees on the windows of the student accommodation.

5.5 Trees Works

5.5.1 Prior to the erection of protective fencing, there are four trees which, in order to maintain their health and future structural integrity, require some maintenance works.

5.5.2 All tree work is to be undertaken in accordance with the British Standard (BSI, 2010) BS3998:2010 "*Recommendations for Tree Work*". Full details of all trees requiring work is given in Table 8.

Table 8: Schedule of tree works

Tree No.	Species	Works	Category
T13	*Tilia x euchlora*; Crimean lime	Remove hanging branch	B1;2
T16	*Ailanthus altissima;* tree of heaven	Reinspect in late-October / November to identify fungus	B1;2
T17	*Platanus x hispanica;* London plane	Determine extent of cavity	A1;2
T26	*Platanus x hispanica;* London plane	Determine extent of cavity	A1;2

5.6 Construction Work Within RPAs

5.6.1 No major construction work is planned within the RPAs of the any of the retained trees.

5.6.2 Due to the presence of retaining and building walls within the RPAs of some of the trees surveyed, the shape of their RPAs has been altered to reflect the presence of these root barriers. It is also likely that the RPAs of the street trees surveyed (T7 – T14) are smaller than those depicted on the TCP (see Figure 2) as they are planted in tree pits.

5.6.3 A new footpath and area of paving is proposed within the RPA of T18. In order to avoid any root damage or soil compaction, this will need to be installed using 'no-dig' construction techniques based on those outlined in Arboricultural Practice Note 12 '*Through the Trees to Development*'. This is discussed further within Section 6.10 of the AMS.

5.7 Services and Utilities

5.7.1 Detailed drawings of underground services are not available at this time. Therefore it is not possible to identify any specific potential impacts associated with the site at this stage. However, it is assumed that existing services will be utilised, as the use of the site is not changing as a result of the development.

5.7.2 Where existing services situated within RPAs require upgrading, care must be taken to minimise any disturbance. Trenchless techniques should be employed where feasible, and only where absolutely necessary should manual excavation be considered.

5.7.3 If new services are to be introduced into the site, they should be located outside of the RPAs where they will not interfere with tree roots. Final positions of any proposed services should be verified and approved by an arboricultural consultant and the Local Authority Tree Officer before implementation.

5.7.4 If service installation is required within RPAs then the guidelines within the National Joint Utilities Group publication (NJUG 4) should be adhered to.

5.8 Post Development Management

5.8.1 As there will be no change in use of the site, there should be no requirement to change the current management programme. If there is no current management programme for this and the other trees on site, it is recommended that the National Tree Safety Group publication, '*Common sense risk management for trees'* (NTSG, 2011) is consulted for guidance on the appropriate level of management required.

5.9 New Planting

5.9.1 Although no new tree planting is shown on the proposed layout it should be possible to incorporate new trees into the open courtyard areas. Small native species such as rowan (*Sorbus aucuparia*) or silver birch (*Betula pendula*) would be suitable for these areas.

5.9.2 If new tree planting is to be undertaken, the areas designated for it should be protected from compaction and contamination during the construction phase, via the use of ground protection.

5.10 Conclusion

5.10.1 There should be no harm caused to any trees planned for retention by these proposals, subject to the erection of protective fencing and the creation of a Construction Exclusion Zone. There are therefore no arboricultural reasons why this scheme should not proceed.

5.10.2 Although the proposed development will result in the removal of seven trees, six of these are either Category C or U, the loss of which will not have a significant detrimental effect on the arboricultural value of the site.

5.10.3 Once detailed finalised drawings for the underground services have been produced, they should be reviewed by an arboricultural consultant.

6. Arboricultural Method Statement (AMS)

6.1 Documents

6.1.1 This AMS has been based on documents produced by TP Bennett LLP and Macfarlane Wilder. The details of these documents can be seen in Table 9.

Table 9: Documents upon which this assessment has been based

Originator	Reference No.	Title
TP Bennett LLP	C08 - 099 - P1	Proposed Plans - Lower Ground Floor Plan
TP Bennett LLP	C08 - 100 - P1	Proposed Plans - Ground Floor Plan
Macfarlane Wilder	1488.P101	Landscape Masterplan

6.1.2 The relationship between the trees and the proposed development are shown on the Tree Protection Plan (TPP), (see Figure 3) which is based on the Tree Constraints Plan (TCP01) and the drawings detailed in Table 9.

6.2 Purpose of AMS

6.2.1 The purpose of this AMS is to demonstrate how work will be undertaken on the site to avoid an unacceptable impact on, and provide an adequate level of protection for, the retained trees.

6.2.2 This AMS sets out the tree protection required to facilitate the proposed development, and should not be read as a definitive engineering or construction statement for this site. Matters relating to construction or engineering detail should be referred to a qualified structural engineer for further information and specification.

6.2.3 This AMS is to be used in conjunction with the Tree Protection Plan (TPP01) in Figure 3.

6.3 Supervision

6.3.1 As the there is no requirement for any major work within the RPAs of the retained trees, there should be no need for any part of the construction phase to require arboricultural supervision.

6.3.2 However, any changes to the nature and sequence of works specified in this AMS regarding the retained trees should be agreed with an arboricultural consultant at least 48 hours before their realisation.

6.4 Tree Removals and Pruning

6.4.1 A total of seven trees require removal prior to the commencement of the construction phase, as detailed in Table 7 of the AIA. The stump should be left in place or ground out to 450mm below ground level.

6.4.2 Four trees require maintenance work prior to the commencement of the construction phase. These trees are detailed in Table 8 of the AIA.

6.4.3 Trees requiring pruning shall have the works carried out in accordance with BS3998:2010 '*Recommendations for Tree Work'*.

6.4.4 Care is to be taken of the ground around retained trees to make sure that it does not become compacted as a result of tree surgery operations. No equipment or vehicles such as timber lorries, tractors, excavators or cranes should be parked or driven beneath the crowns of any retained trees, to prevent subsequent soil compaction and root death.

6.4.5 All arisings are to be removed and the site is to be left in as tidy and orderly manner as possible.

6.5 Protective Fencing

6.5.1 Temporary fencing will be erected during the landscaping works within Cartwright open space, as indicated on the Tree Protection Plan (TPP01) in Figure 3. The specification for this fencing will be in accordance with the recommendations given in BS5837:2012 '*Trees in Relation to Design, Demolition and Construction – Recommendations*' (BSI, 2012). It will comprise 2.0m high mesh fencing (Heras type panels are a simple, readily available solution) attached to a scaffold framework. Support scaffolds will be attached to the scaffold framework as necessary at an angle of 45 degrees on the side of the trees and anchored by further scaffold poles carefully firmed into the ground. The vertical scaffold tubes will be spaced at a maximum interval of 3m. Clear signs will be attached at 6m intervals along the fencing stating 'Construction Exclusion Zone – No Access'.

6.5.2 A diagram illustrating an example of the protective fencing can be seen in Appendix 3.

6.5.3 The area protected by the fence shall be known as the Construction Exclusion Zone (CEZ).

6.5.4 The following principles must be maintained within the CEZ:

- Existing ground levels shall not be altered;
- No excavation shall occur to avoid root severance;
- No plant or vehicles shall enter the CEZ;
- Impermeable surfacing shall not be laid down over soil ('capping');
- No materials, fuels or chemicals shall be stored within any of these areas;
- No fires to be lit where flames may reach within 5m of the CEZ;
- No structures or fixtures of any kind shall be fastened in any way to the trunks of the retained trees;
- No drainage or irrigation pipes shall be installed within the RPAs of the retained trees; and
- Any unwanted vegetation shall be removed by hand.

6.5.5 The fencing shall remain in place until soft landscape operations require its full or partial removal. No other construction activity will take place within those areas formerly protected by the fence.

6.6 Ground Protection

6.6.1 Ground protection within RPAs during the landscaping works within Cartwright Gardens open space will be afforded by existing hard standing where indicated on Figure 3. Additional ground protection will also be utilised in areas where RPAs extend beyond the tree protection fencing (see Figure 3). This ground protection will consist of a single thickness of scaffold boards, laid on top of a layer of a compressible substrate (such as woodchip), on top of a geotextile as specified in Section 9.3 of the BS5837:2012 '*Trees in Relation to Design, Demolition and Construction – Recommendations'*, if the area is intended for pedestrian use only. Timber scaffold boards shall be secured to each other to prevent them moving apart.

6.7 Removal of Hard surfaces within the RPA

6.7.1 Hard standing in the form of an existing tennis court requires removal from within the RPAs of T26, T31, T32, T33 T41 and T42. To prevent damage to any underlying roots this will be removed by hand, where possible. Machinery can be used if necessary to break up and remove larger or more substantial sections of the surface; however, the machinery should be footed outside of the RPA or on sections of the surface not yet removed

6.8 Construction within RPAs

6.8.1 There is no requirement to undertake any major construction work within the RPAs of any of the retained trees for this development.

6.9 Services and Utilities

6.9.1 All underground services and drainage routes shall be located so that no excavations are required within the RPAs of the retained trees. In this instance, the best route onto the site is along the southern boundary or the north-west corner of the site.

6.9.2 In the event that an incursion into an RPA is unavoidable, the installation shall comply with the methods and guidelines detailed in "*Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees*" NJUG 4 (2007). If this does occur, then an arboricultural consultant shall be consulted before any works commence within the RPA to agree the methodology for the excavation.

6.10 Landscaping

6.10.1 The plans provided show landscaping with the RPAs of T16, T17 and T18, in the form of a new footpath and paved area. In order to prevent root damage and soil compaction, these will be constructed on top of the existing ground level using 'no-dig' construction techniques, based on those detailed in Arboricultural Practice Note 12 '*Through the Trees to Development'.* The existing vegetation will be removed by hand and a layer of geotextile laid; on top of this a cellular confinement system will be installed and filled with a suitable aggregate. This will then be covered with a permeable surface material and held in placed by staked siding boards. As the path and paving area are likely to only be used by pedestrians, it should be possible to achieve suitable protection from soil compaction using a 75mm cell depth.

6.10.2 Any further landscaping to be undertaken post-construction should adhere to the principles of the CEZ (as detailed in Section 6.5.4), with particular reference to level changes, root severance and 'capping' with impermeable materials. If impermeable surfaces are to be laid within the RPA of any of the retained trees, then they should not cover greater than 20% of the area.

6.10.3 It is suggested that an area of mulch be added to the base of the trees should any soft landscaping take place. An area of $1m^2$ and 5-10cm depth of shredded bark, bark chips or well-composted green waste to conform to PAS 100 (BSI, 2005b) is suggested. Mulch should not be spread so that it is piled against the base of the tree.

6.11 Sequence of Works

6.11.1 A logical sequence of events is to be observed as show in Table 10.

Table 10: Sequence of works

Stage	Event	Arboricultural Supervision required
Stage 1	Carry out tree removals and works specified in Table 7 and 8, respectively.	No
Stage 2	Install protective fencing and ground protection in the positions shown on Figure 3.	No
Stage 3	Complete main construction phase of development.	No
Stage 4	Complete all landscaping (including the works within the RPAs of T16, T17 and T18).	No
Stage 5	Removal of all machinery from site.	No
Stage 6	Dismantle protective fencing by hand and remove from site.	No

7. References

7.1.1 British Standards Institution (2012) BS5837:2012 *Trees in Relation to Design, Demolition and Construction – Recommendations.* BSI, London.

7.1.2 British Standards Institution (2010) BS3998:2010 *Recommendations for tree work.* BSI, London.

7.1.3 British Standards Institution (2005b) *Publicly Available Specification 100 (PAS 100:2005).* BSI, London.

7.1.4 HM Government. *The Town and Country Planning (Tree Preservation) (England) Regulations 2012*. London: Office of Public Sector Information (OPSI).

7.1.5 Johnson, O. & More, D. (2004) *Collins Tree Guide*. London: HarperCollins

7.1.6 Lonsdale, D. (1990) *Principles of Tree Hazard Assessment and Management*. The Stationery Office, London.

7.1.7 Matheny, N. & Clark, J.R. (1998) *Trees and Development.* ISA, Champaign, IL.

7.1.8 Mattheck, C. & Breloer, H. (1994) *The Body Language of Trees.* The Stationery Office, London.

7.1.9 National Joint Utilities Group (NJUG) (2007) *Guidelines for the planning, installation and maintenance of utility services in proximity to trees*. NJUG, London.

7.1.10 National Tree Safety Group (NTSG) (2011) *Common sense risk management of trees*. Forestry Commission.

7.1.11 Office of the Deputy Prime Minister (ODPM) 2006, *Tree Preservation Orders, A Guide to the Law and Good Practice.* Office of Public Sector Information (OPSI).

7.1.12 Patch, D. & Holding, B. (1996) *Arboricultural Practice Note 12: Through the Trees to Development.* Arboricultural Practices Notes.

7.1.13 Robertson, J, Jackson, N & Smith, M (2006) *Tree Roots in the Built Environment.* The Stationery Office, London.

8. Appendix 1 - Tree Schedule

Tree/ Group No.	Species	Height (m)	Stem Diameter (mm)	Canopy Spread (m)				Height of Lowest Limb and Direction (m)	Crown Clearance (m)	Age Class	Estimated Remaining Contribution (years)	Condition		Comments	Preliminary Management Recommendations	BS Category	RPA (m^2)
				N	E	S	W					Physiology	Structure				
T1	*Acer saccharinum*; silver maple	14	270	4	4	4	4	-	3	Middle-aged	20-40	Fair	Fair	Basal epicormic growth, history of crown reduction, bird's nest	-	C1,2	33
T2	*Cotoneaster frigidus*; Himalayan tree cotoneaster	7	310	2	4	2	2	-	1.5	Mature	10-20	Good	Fair	Twin stem, basal epicormic growth	-	C1,2	30
T3	*Cotoneaster frigidus*; Himalayan tree cotoneaster	6	330	3	3	3	3	-	1	Mature	10-20	Good	Fair	Multistem, basal epicormic growth	-	C1,2	34
T4	*Fraxinus excelsior*; ash	12	250	3	3	3	3	-	4	Middle-aged	20-40	Fair	Fair	History of crown reduction	-	C1,2	28
T5	*Betula utilis*; Himalayan birch	10	170	2	2	2	2	-	2	Middle-aged	<10	Dead	Poor	-	Fell to ground level	U	13
T6	*Betula utilis*; Himalayan birch	15	310	3	4	3	3	-	2	Mature	20-40	Good	Fair	Codominant stem from 1.5m	-	B1,2	43
T7	*Acer negundo*; box elder	13	300	4	3	2	4	-	5	Mature	10-20	Fair	Fair	Off-site street tree, codominant stem from 2m, history of crown reduction, pruning wounds	-	C1,2	41

Tree/ Group No.	Species	Height (m)	Stem Diameter (mm)	Canopy Spread (m) N	E	S	W	Height of Lowest Limb and Direction (m)	Crown Clearance (m)	Age Class	Estimated Remaining Contribution (years)	Condition Physiology	Structure	Comments	Preliminary Management Recommendations	BS Category	RPA (m^2)
T8	*Sorbus intermedia*; Swedish whitebeam	11	370	3	3	3	3	-	5	Mature	20-40	Good	Good	Off-site street tree, crown lifted on road side	-	B1,2	62
T9	*Sorbus intermedia*; Swedish whitebeam	12	300	3	3	2	2	-	5	Middle-aged	20-40	Fair	Fair	Off-site street tree, major roadside stem wounds	-	C1,2	41
T10	*Acer negundo*; box elder	12	350	4	3	5	2	-	4	Mature	10-20	Fair	Fair	Off-site street tree, history of crown reduction, bark wounds on lower stem, exposed damaged roots, vehicle damage to scaffold limbs	-	C1,2	55
T11	*Sorbus aucuparia*; rowan	10	240	2	2	2	2	-	5	Middle-aged	10-20	Fair	Fair	Off-site street tree, sulphur tuft fungus (*Hypholoma fasciculare*) at base, vehicle damage to scaffold limbs, pruning stubs	-	C1,2	26
T12	*Acer negundo*; box elder	14	330	5	4	4	2	-	5	Mature	20-40	Good	Fair	Off-site street tree, history of crown reduction	-	B1,2	49
T13	*Tilia x euchlora*; Crimean lime	15	310	3	3	3	3	-	4	Middle-aged	>40	Good	Good	Off-site street tree, good form, small hanging branch	Remove hanging branch	B1,2	43
T14	*Tilia x euchlora*; Crimean lime	14	270	2	3	3	3	-	4	Middle-aged	>40	Good	Good	Off-site street tree, basal epicormic growth	-	B1,2	33

Tree/ Group No.	Species	Height (m)	Stem Diameter (mm)	Canopy Spread (m) N	E	S	W	Height of Lowest Limb and Direction (m)	Crown Clearance (m)	Age Class	Estimated Remaining Contribution (years)	Condition Physiology	Structure	Comments	Preliminary Management Recommendations	BS Category	RPA (m^2)
T15	*Tilia x europea;* common lime	12	340	3	2	4	3	4N	3	Middle-aged	>40	Good	Fair	Pollard; basal epicormic growth; pruning wounds on stem	-	B1;2	52
T16	*Ailanthus altissima;* tree of heaven	20	830	1	6	6	7	8E	6	Mature	20-40	Good	Fair	Small mass of juvenile fungal fruiting bodies at base - unidentifiable; minor deadwood in crown	Reinspect in late October/November to identify fungus	B1;2	312
T17	*Platanus x hispanica;* London plane	24	1170	10	7	7	8	6N	8	Mature	>40	Good	Fair	Minor stem cavity associated with old pruning wound; history of crown reduction; tag no. 0446	Determine extent of cavity	A1;2	619
T18	*Platanus x hispanica;* London plane	25	1050	7	8	7	8	14N	8	Mature	>40	Good	Good	Codominant stems from approx. 8m; tag no. 0447	-	A1;2	499
T19	*Crataegus crus-galli;* cockspur thorn	5	130	2	2	2	2	2S	2	Middle-aged	10-20	Good	Fair	Tag no. 0449	-	C1	8
T20	*Malus* Sp.	4	180	2	2	2	2	2E	2	Middle-aged	10-20	Fair	Fair	Triple stem; tag no. 0605	-	C1	21
T21	*Platanus x hispanica;* London plane	25	900	8	8	9	8	8SW	8	Mature	>40	Good	Good	-	-	A1;2	366
T22	*Malus* Sp.	5	130	2	1	1	1	2E	1.5	Middle-aged	10-20	Fair	Fair	Deadwood in crown	-	C1	8

Tree/ Group No.	Species	Height (m)	Stem Diameter (mm)	Canopy Spread (m) N	E	S	W	Height of Lowest Limb and Direction (m)	Crown Clearance (m)	Age Class	Estimated Remaining Contribution (years)	Condition Physiology	Structure	Comments	Preliminary Management Recommendations	BS Category	RPA (m^2)
T23	*Acer platanoides;* Norway maple	16	430	5	6	7	6	2W	3	Middle-aged	20-40	Good	Good	Minor deadwood in crown; tag nos. 0602 and 0453	-	B1;2	84
T24	*Platanus x hispanica;* London plane	27	1550	14	8	9	7	7S	3	Mature	>40	Good	Good	-	-	A1;2	707 (capped)
T25	*Acer saccharinum;* silver maple	16	490	4	4	4	4	6S	1.5	Middle-aged	20-40	Good	Fair	Poor form; topped in past; exposed/damaged roots; tag no. 0423	-	B1;2	109
T26	*Platanus x hispanica;* London plane	26	1220	9	8	9	7	11S	5	Mature	>40	Good	Fair	Stem cavity associated with old pruning wound; tag nos. 0424 and 0613	Determine extent of cavity	A1;2	673
T27	*Acer pseudoplatanus;* sycamore	17	560	4	7	7	4	10S	4	Mature	20-40	Good	Fair	-	-	B1;2	142
T28	*Platanus x hispanica;* London plane	26	1140	11	8	10	6	2N	8	Mature	>40	Good	Good	-	-	A1;2	588
T29	*Platanus x hispanica;* London plane	27	1490	9	7	8	8	3E	5	Mature	>40	Good	Good	Codominant stems from approx. 6m	-	A1;2	707 (capped)
T30	*Sorbus aria;* whitebeam	11	280	4	4	4	4	2.5N	2	Middle-aged	20-40	Good	Good	Codominant stems from approx. 2m	-	B1;2	35

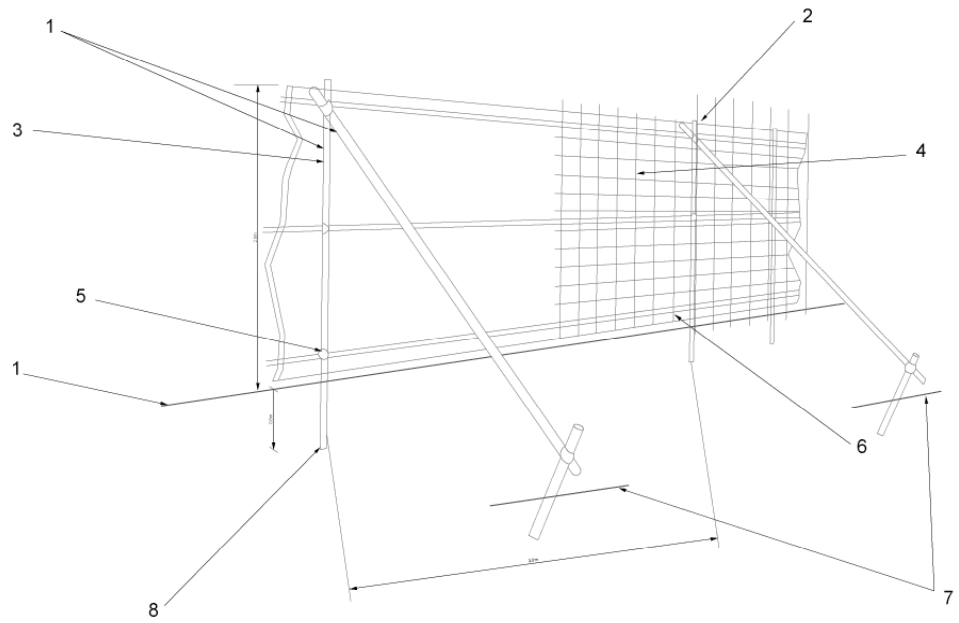
Tree/ Group No.	Species	Height (m)	Stem Diameter (mm)	Canopy Spread (m) N	E	S	W	Height of Lowest Limb and Direction (m)	Crown Clearance (m)	Age Class	Estimated Remaining Contribution (years)	Condition Physiology	Structure	Comments	Preliminary Management Recommendations	BS Category	RPA (m^2)
T31	*Tilia x europea;* common lime	13	480	5	5	4	5	8E	5	Middle-aged	>40	Good	Fair	History of crown reduction; dense epicormic growth obscuring base	-	B1;2	104
T32	*Platanus x hispanica;* London plane	26	1870	8	8	8	8	4N	8	Mature	>40	Good	Good	Lapsed pollard; damaging curb; tag nos. 0432 and 0621	-	A1;2	707 (capped)
T33	*Platanus x hispanica;* London plane	28	1200	7	8	9	8	9E	6	Mature	>40	Good	Good	-	-	A1;2	651
T34	*Platanus x hispanica;* London plane	27	1700	8	8	8	8	12W	8	Mature	>40	Good	Good	Codominant stems from approx. 7m; tag nos. 0434 and 0623	-	A1;2	707 (capped)
T35	*Ulmus glabra;* wych elm	6	260	4	2	3	3	4S	2	Middle-aged	20-40	Good	Fair	Basal epicormic growth; pruning stub; tag no. 0624	-	B1	31
T36	*Tilia x europea;* common lime	22	760	5	5	5	5	13E	8	Mature	20-40	Good	Fair	Epicormic growth on base and stem	-	B1;2	261
T37	*Ailanthus altissima;* tree of heaven	12	280	3	4	2	4	4E	2	Middle-aged	20-40	Good	Fair	-	-	C1	35
T38	*Ailanthus altissima;* tree of heaven	12	330	2	5	4	5	3W	3	Middle-aged	20-40	Good	Good	-	-	C1	49

Tree/ Group No.	Species	Height (m)	Stem Diameter (mm)	Canopy Spread (m) N	E	S	W	Height of Lowest Limb and Direction (m)	Crown Clearance (m)	Age Class	Estimated Remaining Contribution (years)	Condition Physiology	Structure	Comments	Preliminary Management Recommendations	BS Category	RPA (m^2)
T39	*Tilia x europea;* common lime	21	640	5	4	6	4	4N	2	Mature	20-40	Good	Fair	Slight lean to south; epicormic growth on stem	-	B1;2	185
T40	*Prunus avium;* wild cherry	14	510	5	5	5	5	3NE	1.5	Mature	20-40	Good	Good	Mower damage to exposed roots; tag nos. 0456 and 0625	-	B1	118
T41	*Prunus avium;* wild cherry	14	430	5	5	4	3	3SE	1	Mature	20-40	Good	Good	Mower damage to exposed roots; tag no. 0627	-	B1	84
T42	Tilia cordata; small-leaved lime	19	540	5	3	4	8	2.5NW	2	Mature	20-40	Good	Good	-	-	B1	132

9. Appendix 2 – Table of Quality Assessment

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have serious, irremediable, structural defects, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality NOTE Category U trees can have existing or potential conservation value which might be desirable to preserve			DARK RED
	1 Mainly arboricultural values	**2 Mainly landscape values**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or of formal or semi-formal arboricultural features (e.g. the dominant and/or principle trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical commemorative or other value (e.g. veteran trees or wood-pasture)	LIGHT GREEN
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	MID BLUE
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	GREY

10. Appendix 3 – Example of Protective Fencing



1. Standard scaffold poles.
2. Uprights to be driven into the ground.
3. Heras panels secured to uprights with ties and where necessary standard scaffold clamps.
4. Weldmesh wired to the uprights and horizontals.
5. Standard clamps.
6. Wire twisted and secured on inside face of fencing to avoid easy dismantling.
7. Ground level.
8. Approx. 0.6m driven into the ground

Tree Protection Fencing